Physics 411—Mechanics (Winter 2015)
Course Information
http://alemanlab.uoregon.edu/courses/physics-411-mechanics-winter-2015/

This course covers the fundamental principles of Newtonian and Lagrangian mechanics, together with applications including conservation laws, oscillations and waves, systems of particles, planetary motion, non-inertial reference frames, rigid bodies, and rotation. The goal of the course is to develop mathematical, computational (with Mathematica®), and physical tools to solve a wide variety of mechanics problems.

Lectures: MWF 11-12 a.m. in 318 Willamette Hall

Instructor: Prof. Benjamin J. Alemán
Email: baleman@uoregon.edu
Office: 178 Willamette Hall Phone: 346-3221
Office Hours: Mondays and Fridays from 12-1, by appointment, or stop by.

Graduate Teaching Fellow: Saba Moslehi, sabam@uoregon.edu
Office Hours: W 4-5 pm and Th 2-3 in Willamette 72, and in Drop-in center (check schedule).

Other good books:
- Goldstein, Poole & Safko, *Classical Mechanics* (Addison-Wesley, 2002)

All books will be on reserve in the Science Library.

Grading:
Grades are based on homework, a course project, the midterm, and the final exam:
- **Homework:** 30%
- **Project:** 10%
- **Midterm:** 25%
- **Final exam:** 35%

- **Homework** is due once a week, starting week 2. Assignments will be posted on the website: http://alemanlab.uoregon.edu/courses/physics-411-mechanics-winter-2015/.
  Homework must be turned into the 411 box in the basement of Willamette Hall by 7 pm each Thursday, unless otherwise specified. Late homework will be marked down 25% for the first day; homework turned in more than one day late will be marked as a zero. Homework counts for 30% of your grade. Homework should be worked on individually, not as a group. Your homework must be neat and legible; messy, illegible homework will be returned ungraded and marked as a zero. Remember, messy work is indicative of a messy mind; slow down and do it right ☺️. The course GTF will be available several hours per week to assist you in your homework.
  - We will be learning to use Mathematica to solve some mechanics problems computationally, and you will be assigned an occasional homework problem that requires Mathematica. Please download and install a free copy of Mathematica through the University of Oregon’s site license by following the instructions here: https://it.uoregon.edu/software/mathematica. Alternatively, you can access Mathematica in the Science and Mathematics library computer workstations.
- You will need to choose your own unique **Course Project**. Please discuss your proposed project with me before beginning; a short written proposal will be due by **Friday, February 13th**. Ideas for projects include writing a short paper on a mechanics-related research article, performing a numerical simulation of a mechanics problem, or reading
and summarizing an extra chapter from our course text, analyzing the physics of a movie, making yourself mechanics notecards, etc. The project is 10% of your grade and is due by the time of the Final Exam (Tuesday March 18th, 10:15 am.)

- The **Midterm** will be on Monday February 9th, in class. It will be closed book, closed notes (one single-sided 8.5 “ X 11 “ formula sheet allowed), and counts for 25% of your grade. No excuses other than medical ones will be accepted for missing/rescheduling the exam.
- The **Final exam** is scheduled for Tuesday March 18th, 10:15 am. It will be closed book, closed notes (two single-sided 8.5 “ X 11 “ formula sheets, or equivalent, allowed), and counts for 35% of your grade. No excuses other than medical ones will be accepted for missing/rescheduling the exam.

**Weather:** In case of inclement weather, check the UO homepage (http://www.uoregon.edu/) for information on delays or cancellations.

**Approximate Course Schedule (will likely be altered)**

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<thead>
<tr>
<th>Week</th>
<th>Topics and Taylor Chapters</th>
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<tbody>
<tr>
<td>1 (Jan. 5-9)</td>
<td>Vector Algebra and Calculus; Newtonian Mechanics Ch. 1 &amp; 2</td>
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<tr>
<td>2 (Jan 12-16)</td>
<td>Newtonian Mechanics: examples; Momentum and Angular Momentum Ch. 2 &amp; 3</td>
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<td>3 (Jan. 19-23) Jan. 19th MLK Holiday (NO CLASS Monday)</td>
<td>Energy Ch. 4</td>
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<td>4 (Jan. 26-30)</td>
<td>Oscillations; Fourier Analysis Ch. 5</td>
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<td>5 (Feb. 2-6)</td>
<td>Continuum Mechanics and Waves Ch. 16</td>
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<td>6 (Feb. 9-13)</td>
<td>Midterm on Monday, Feb. 9th. Course Project Proposals due by Friday, Feb. 13th. The Calculus of Variation; Lagrangian Mechanics, Hamiltonian Mechanics Ch. 6, 7, &amp; 13</td>
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<td>7 (Feb. 16-20)</td>
<td>The Two-Body Problem, Planetary Motion, Non-inertial reference frames Ch. 8 &amp; 9</td>
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<td>8 (Feb. 23-27)</td>
<td>Rotational Motion; Rigid Bodies Ch. 10</td>
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<td>9 (March 2-6)</td>
<td>No Class or Guest Lectures Monday and Wednesday Rigid Bodies Ch. 10</td>
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<td>10 (March 9-13)</td>
<td>Coupled Oscillators; Summary Ch. 11</td>
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<td>11 (March 16-20) Finals Week</td>
<td>Final Exam: 10:15 Tuesday, March 17</td>
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